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Looking Forward

ON another page a brief account is published of the opening of the new session at the Royal Veterinary College. At that ceremony Sir William Slater, Secretary of the Agricultural Research Council, presented prizes won in the previous session. In the course of his address to the students Sir Willliam said:—

"I believe that veterinary science is entering into a golden age. For too long it has suffered from an inferiority complex, trying to compare itself with human medicine. So long as it did so it was certain to be looked on as the poor relation. It is essentially different, equally important, and in many ways more difficult and complex.

"It is true that veterinary science is younger than the science of human medicine, in that until recently there have been far fewer workers and much poorer facilities. The position is steadily improving. The veterinary schools have been strengthened in staff and in equipment, and more research laboratories are available for a growing army of workers. There is still much to be done before the position can be considered adequate. Even with its so far limited resources, veterinary science has a proud record of achievement.

"Expansion is not merely a question of providing more funds; it depends to a much greater extent on the supply of well-equipped and enthusiastic workers. The financial rewards of the research worker, or the university teacher, are never likely to be as high as those in veterinary practice—they are not in human medicine or other branches of science—but provided they are adequate a research career holds out prospects of an exciting and full life.

"You may feel that I am stressing too much the research side of veterinary work, but I would remind you that the profession as a whole will be judged on its ability to explain the causes of disease and to develop new methods of combating it. If veterinary science is to win its rightful place it must never rest on its laurels and be complacent, it must be continually advancing in its knowledge and techniques.

"Because it is young in this sense, veterinary science holds out more fascinating prospects than the older sciences. Many of the fields are still relatively unexplored and a rich reward is waiting for those who enter into them.

"Another way in which veterinary science differs from that of human medicine is that over a large part of the work economics enters into our considerations. However economically valueless a human life is, it must be saved; the same applies to our pet animals, whose companionship and affection cannot be measured in terms of money. But in food-producing animals the cost of treatment must be less than the economic value of the animal. The farmer in general will not pay to keep a useless animal alive. This inevitably means that the veterinarian has to think increasingly of preventive treatments applied to a herd or flock, and to a decreasing extent of the treatment of the individual animal. Farmers are becoming more alive to the need for considering the veterinarian not as someone to call in only in an emergency, but as a regular visitor whose task it is to guide him in maintaining a high standard of health in the animals on his farm. We need, however, to develop this conception until the farmer thinks of his veterinary fees as a regular and proper insurance policy, and not as something which only appear in his accounts when he is unlucky. This is particularly important where the individual animals are of small value, such as a commercial poultry flock. If veterinary advice could eliminate half the diseases of our poultry flocks, the saving would, I believe, pay a large part of the fees of all those in veterinary practice.

"Veterinary science differs, too, from human medicine in that it deals not with one animal species but with many. There has been an unfortunate tendency in the past to assume that findings in medical research can be used by analogy in veterinary work. It is true that in medical research the cat and the dog have been widely studied and workers in this field have used the findings from these investigations in human physiology and pathology. The extent to which this knowledge can be applied to most of our farm animals is, however, limited, and even within these limits the evidence must be most critically examined.

"It is in order to further as rapidly as possible the extension of our knowledge of the physiology of farm animals that my Council has set up the Institute of Animal Physiology at Babraham, near Cambridge.

"The veterinary surgeon working with farm animals is like the private doctor to an eastern potentate, in that the population he has to consider consists of one important male together with a large number of females and their numerous offspring. Gynaecology, obstetrics and paediatrics must form a much larger part of his work than they do in that of the ordinary medical practitioner, with the accompanying need to study the endocrinology of the reproductive processes in different species.

"On the other hand, because few farm animals ever reach old age, the problems of geriatrics and the diseases of the aged, which loom so largely in human medicine, are relatively unimportant.

"Perhaps the veterinarian is fortunate in that his patients cannot tell him about their symptoms; it saves him time and prevents him from being unnecessarily bored, but it does present him with a special set of problems, particularly in the early diagnosis of disease before the more marked symptoms appear. I believe that in the future the veterinarian will overcome this difficulty by the extended use of chemical and biological tests. Before he can do so, however, we must know far more than we do at present about the normal variations in the healthy animal.

"Human medicine, of course, has a special place in society. We are told: 'the devil was sick, the devil a saint would be' and certainly nothing—his wealth, his power, his ambitions—is so important to man as his life. The practice of medicine, therefore, holds the highest place in his esteem and by the side of it veterinary medicine may be dwarfed. This is, however, a wholly mistaken view. The ultimate health and survival of a human population, which is growing at an alarming rate, will depend upon a soundly balanced diet, which must include a minimum of high quality protein from animal sources. Over large areas of the world men are now suffering from a lack of this essential element in their food. It is on the veterinarian more than on anyone else that the task of increasing the world's supply of animal proteins rests. Whilst, therefore, human medicine has the task of maintaining the health of mankind, it cannot achieve success, and in fact may fail miserably by merely creating more hungry mouths, unless the veterinarian at the same time maintains the health and increases the productivity of flocks and herds upon which mankind depends."

CIVIL DEFENCE AND THE FARMER

Educating farmers in the protection of their crops and animals against radio-activity is best done by veterinary surgeons, in the view of Major-General J. S. Lethbridge, a South-west Regional Director of Civil Defence. During a question session with the County Civil Defence Committee at Truro last week he said: "I am perfectly certain we are right in trying to get at them through the veterinary surgeons, because the farmer will believe his 'vet' when he won't believe the gentleman in pin-striped trousers from Whitehall."

In Brief

BLOAT

A number of interesting observations on bloat in dairy cattle in relation to grazing behaviour have been made in New Zealand by Hancock (1954). Cattle on potentially dangerous pastures were found to have shorter than normal grazing times with fewer periods of intense activity in grazing. This is, the author states, contrary to the view that bloat is caused by a too-greedy consumption of the pasture. It was also noticed that cattle on bloat-producing swards had reduced rumination times, and that although rumenal atony was observed in the advanced stages of bloat, in the early stages movement of the rumen and belching increased in frequency and intensity. There was evidence that inheritance is an important factor in the occurrence of bloat among cattle grazing the same pasture.

During the season of abundant grass growth the normal system of grazing used by dairy farmers in New Zealand is to make a daily allocation of pasture. The amount of grass provided is usually so liberal that at the end of 24 hours approximately 25 per cent. of the available grass remains ungrazed. Using this method for the control groups four methods of bloat prevention were tested.

In the first method the daily allocation was divided into a number of portions, or breaks, and the cows were allowed onto a new break at certain times in the day, back grazing being allowed. With the second method the pasture was again divided into breaks but a new break was not made available until the previous break was sufficiently closely grazed. Neither of these methods was effective in controlling bloat.

In the third method there was a restriction placed on the time allowed on the pasture. The cows were allowed on the pasture for eight time periods on a pre-set time schedule. The length of the periods varied from half to three and three-quarter hours and gave the cows an average of approximately eight and a half hours per day on the pasture as compared with 20 hours for the control group. Cases of bloat were recorded in both groups, and in the restricted animals there were more cases of mild bloat than in the control group. However, a higher incidence of the more severe form of the condition was recorded in the control cows and, furthermore, while there was only one case classified as dangerous bloat in the restricted group 16 cases occurred in the control cows. Although this method of bloat control is promising it is time consuming and involves an undesirable transference of soil fertility.

The best control of bloat was obtained with the fourth method. Here the bloat producing potential of a pasture at three different stages of maturity was tested. The incidence of severity of bloat was much lower in the group of cows grazing the most mature pasture, where the white clover length was 10 inches, the perennial rye grass in full flower and the crude fibre content was 26.3 per cent. It is obvious that this method limits the use of grazing for relatively long periods, and would be wasteful as young protein-rich herbage would not be fully utilised.

C. S. Grunsell (May 1955).

Reference

HANCOCK, J. (1954). *J. Agric. Sci.* **45**. 80.

Observations on the Composition of an Experimental Semi-synthetic Diet for Baby Pigs

BY

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DURING recent years widespread interest has been shown in the technique for removing baby pigs from their dams within a few days, or even hours, of their birth and of rearing them thereafter on some form of sow milk substitute. The possible advantages to the pig-farmer of such a system of management have often been discussed (*e.g.* Tribe, 1954) and the technique has given encouraging results when used under farming conditions. However, quite apart from its practical advantages, this technique has opened up new and important fields of research in which the baby pig may be employed as the experimental animal (*e.g.* Young & Underdahl, 1953). Before its use in this way can be fully exploited it is necessary to devise a simple method both of individual and group housing, and of feeding, which combines good health and growth in the subject with the necessary degree of experimental control (McCrea & Tribe, 1954). Present knowledge concerning the management of the baby pig as a laboratory animal has been reviewed by Tribe (1956). The gaps in our knowledge, however, are many and, in particular, information is scanty on the type of diet it is best to feed the baby pig during the first month of life. Investigations into this problem have been progressing at this laboratory for the past three years, and the present paper describes some of the results obtained. Although the prime object of this study has been the development of a semi-synthetic diet which can be used as a basis for future work of a nutritional nature, inevitably consideration has also had to be given to the type of housing suitable for experimental piglets. In view of the almost total lack of basic information on these subjects, it has been necessary to work to some extent by rule of thumb. Where a feature of management gave good results it was retained, and where, as frequently happened, a difficulty arose, adjustments in feeding or housing were made until it disappeared. In order to progress as rapidly as possible, many problems were in this way purposely circumvented, which would, in other circumstances, have been followed up by a more critical investigation.

Housing of Experimental Piglets

The routine procedure was to remove pigs from a sow at 24 hours of age, and to treat them as experimental animals until they were either four or eight weeks old. It was found to be necessary to keep them particularly warm during the first three or four days after removal from the sow. Newland, McMillen & Reineke (1952) have demonstrated that the mechanism which regulates body temperature is not fully developed in the new-born pig, and in order to keep the pig alive during this very early stage, it was found best to maintain an environmental temperature of about 80° F. A 250-watt infra-red heating lamp, of which types specially designed for piglets are now on the market, proved to be an easy and satisfactory way of providing this necessary warmth. After the first few days the temperature was dropped to about 75° F. by altering the position of the lamp, and thereafter the temperature was progressively decreased until at six or seven weeks of age the pigs were maintained at normal room temperatures, *i.e.* between approximately 60° and 65° F.

The housing used was of two types. From the time of removal until three or four weeks of age most pigs were housed in individual cages. These measured 17 by 24 by 16 inches, and were floored with a fine wire-mesh removable mat under which was a dropping tray containing sawdust. Into the front of this cage was slotted a trough for both food and water. By the time the animals weighed about 10 lb. they became too large for these cages, and were transferred to pens on the floor.

The floor pens measured 5 by 3½ feet, and had walls 2 feet high. The walls were removable and thus it was possible to double or treble the pen size by removing the side-walls. These pens were floored with concrete which was covered with sawdust and wood shavings, and each was heated with a 250-watt infra-red lamp. Several litters were never placed in the wire cages, but instead were reared satisfactorily from the start in the floor-pens.

For work of an infectious disease nature special isolation units for young pigs have been described by Young & Underdahl (1953), and, for those nutritional studies in which it is necessary to collect urine and faeces, metabolism cages have been devised by Lehrer & Wiese (1952) and Braude, Kon & Porter (1950). However, for work in which these refinements are not necessary, the type of housing described above is satisfactory, cheap, easy to construct, and clean.

Method of Feeding

The first litters in this study were fed on a system broadly similar to that described by Dyrendahl, Swahn, Björck & Hellving (1953). Under this system two diets were used; the first was fed as a liquid of approximately the same consistency as sow's milk, and the second was fed dry. On a dry matter basis the liquid diet (No. 1) contained 93.5 per cent. dried skimmed milk and 6.5 per cent. lard, together with

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the vitamin and mineral supplement shown in Table I. The dry food (No. 2), which was introduced after the first seven days and then gradually increased

TABLE I
THE VITAMIN AND MINERAL SUPPLEMENTS (PER CWT. OF DIET) USED IN THE EARLIEST EXPERIMENTS. (AFTER DYRENDAHL, 1953.)

	Diet number	
	1	2
Vitamin A, I.U.	1,500,000	1,000,000
„ D, „	150,000	400,000
Thiamine, g.	0·5	—
Riboflavine, g.	0·5	1·2
Niacin, g.	2·5	12·0
Pantothenic acid, g. ...	4·0	1·2
Pyridoxine, g.	0·5	—
Choline chloride, g. ...	25·0	30·0
Vitamin B_{12}, mg. ...	2·0	8·0
Ascorbic acid, g.	12·5	—
Vitamin E, g.	5·0	—
„ K, g.	0·1	—
$MgSo_4$, g.	80·0	—
$FeSo_4$, g.	87·5	350·0
$MnSo_4$, g.	3·7	150·0
$CuSo_4$, g.	12·5	50·0
$CoSo_4$, g.	0·5	30·0
KI, g.	0·7	3·0
$ZnCl_2$, g.	0·5	—
CaF_2, g.	1·0	—
$CaCo_3$, g.	400·0	—
$CaHPo_4$, g....	100·0	—
Penicillin, g.	0·7	0·7

until it replaced the liquid food entirely at seven weeks, consisted of dried skimmed milk 30 per cent., dried grass meal 26 per cent., fish meal 20 per cent., molasses 16 per cent., bonemeal 6.4 per cent., salt 1.6 per cent., and the vitamin and mineral supplement shown in Table I. That these diets give satisfaction is shown by the results in Table II, which relates to a total of 20 pigs derived from two litters. These litters were born on the same day, and a half of the members of each were removed from the sows at 24 hours old and individually caged. The remaining halves were put together on the same sow so that there was the equivalent of one litter of 10 pigs reared in the cages and another, also of 10 pigs, reared with the sow. As can be seen from Table II the caged pigs weighed an average of 34.8 lb. at eight weeks old compared with an average of 33.8 lb. reached by their littermates at the same age after being on the sow.

However, although when judged on the basis of the live-weight gains of the pigs, this diet proved to be satisfactory, it had important, but non-nutritional, disadvantages. It was necessary to feed it six times a day during the first week of life, gradually decreasing the frequency to three times a day at seven weeks of age. Also, it was necessary to feed the liquid diet at approximately body temperature in order to achieve an adequate mixing of the fat throughout the food. Coupled with the difficulties of keeping the food containers clean, this meant that the method was very expensive on time and labour. Also, if an animal failed to drink all the liquid food that was offered, it was not possible to determine its actual nutrient intake, since the liquid was not of a sufficiently homogeneous consistency to allow the assumption that what was drunk had the same composition as the residue. A variety of mechanical stirrers and chemical homogenisers were tried, but none of them solved this problem satisfactorily; the fat always tended to separate out to the top, and the various ingredients in the supplements which were of low solubility sank to the bottom.

It was in order to overcome the difficulties of preparing a homogeneous mixture, and also in an attempt to decrease the labour force needed, that the liquid diet was replaced by a dry meal. It is impossible, of course, to feed a 24-hour-old piglet on dry food alone, but by a process of trial and error it was found possible to cut out a liquid diet altogether by the time the pig is seven days old. A routine procedure was therefore adopted in which, after removal at 24 hours from the sow, the pigs were offered in three separate containers water, a dry meal, and the meal mixed into a creamy paste with water or cow's milk. After seven days the paste was withdrawn, and thereafter the piglets received only the water and meal. Both the meal and the water were fed without stint, and the paste was offered three times each day. This routine proved to be equally as good as the liquid diet method from the point of view of the growth of the pigs, and also it largely solved the difficulties of labour, homogeneity of mixing, and the recording of food intakes.

TABLE II
THE LIVE-WEIGHTS OF TWO LITTERS OF PIGS, ONE-HALF OF EACH REARED WITH THE SOW AND THE REMAINDER REARED IN INDIVIDUAL CAGES

Litter number	Method of rearing	Number of pigs	Sex distribution		Mean individual weights (lb.)		
			♀	♂	Birth	4 weeks	8 weeks
1	Sow	4	2	2	3·0	17·0	34·2
	Caged	5	2	3	3·0	16·2	34·0
2	Sow	6	2	4	2·75	15·2	33·5
	Caged	5	2	3	3·0	15·2	35·5
Total	Sow	10	4	6	2·9	15·9	33·8
	Caged	10	4	6	3·0	15·7	34·8

Composition of Diet

Because of the paucity of information concerning the nutrient requirements of the baby pig, previous workers (*e.g.* Dyrendahl *et al.*, 1953) have tried to err on the side of safety by including in their diets everything that could possibly be required; for example, supplements containing cobalt and ascorbic acid have been described even though theoretically it seems improbable that these nutrients are needed in the diet of the pig. Also, most workers have based their diets upon dried whole or skimmed cow's milk. Since the object of the present study was to evolve a semi-synthetic diet for use in a wide range of nutritional experiments, it was thought best to base the diet on casein, starch, and sucrose, instead of dried milk, and to include in it only those nutrients most probably needed by the baby pigs. Experience

proved that the following formula enabled pigs to average at least 30 lb. in weight at 56 days of age (McCrea & Tribe, 1954): sucrose 40 per cent., maize starch 25 per cent., casein 10 per cent., whole-milk powder 10 per cent., dried yeast powder 10 per cent., and McCollum's salt mixture No. 185 (with iron) 5 per cent. To every 100 g. of diet was added 400 I.U. vitamin A, 100 I.U. vitamin D_3, and 0.002 g. procaine penicillin G. Every pig received the equivalent of 100 μg. of vitamin B_{12} injected intramuscularly at both three days and three weeks of age.

This diet, fed in self-feeders, gave satisfactory but not ideal results, and the following experiments were carried out in order to improve it.

The Yeast Content

Of 63 baby pigs raised on the above formula, almost 30 per cent. showed marked symptoms of rickets by the time they were 8 to 10 weeks old. Since the mineral and vitamin D levels seemed adequate, the content of yeast was dropped to 5 per cent., and the casein level increased to 15 per cent. as Braude, Kon & White (1943) have reported that over 8 per cent. yeast in the diet may induce rickets in pigs. After altering the yeast percentage, the incidence of rickets decreased markedly, although there were occasional cases of leg abnormalities. Teague & Carpenter (1951) have described what appears to be a similar condition in baby pigs reared on a copper-deficient diet, but the administration of copper supplements in the present study failed to prevent or cure the condition.

The rickets encountered was characterised particularly by bowing or inturning of the forelimbs. Occasionally one limb only was affected, while sometimes both limbs bent the same way. The piglets tended to walk on their toes with a stilted gait. Radiological examination showed the presence of rickets, and this was confirmed pathologically (Holmes, 1955).

Once the pigs were removed from the experimental house to normal farm conditions (sow and weaner nuts and exposure to sunlight), the rachitic condition resolved, but deformity of the limbs persisted.

The Carbohydrate Content

Becker, Ullrey & Terrill (1954) compared the nutritive values of dextrose, lactose, sucrose, dextrin, and maize starch for the newborn pig. They found that a combination of lactose and maize starch gave the best weight gains, and that pigs of one to two days of age responded to sucrose with severe diarrhoea, rapid weight loss, unthriftiness, and death. Some pigs, however, developed a marked ability to utilise sucrose by seven days of age. In the light of these findings, it seems strange that the pigs in the present study thrived so well on a diet containing 40 per cent. sucrose, although it must be remembered that they had in addition 25 per cent. maize starch. Eighteen piglets were, however, fed a diet containing 50 per cent. sucrose and 15 per cent. maize starch, and all of them showed the symptoms described by Becker *et al.* (1954), 11 of them dying before seven days of age. There appears, therefore, to be a critical level for the contents of sucrose and maize starch.

In order to compare a sucrose-maize starch diet with a lactose-maize starch diet 18 pigs were divided into two groups similar in weight, sex, and litter-mate distribution. All pigs were removed from the sow at 24 hours old, and one group was offered the diet already described (*i.e.* with 40 per cent. sucrose and 25 per cent. maize starch), while the other was given the same diet with the sucrose entirely replaced by lactose. Table III gives the average bodyweights of the two groups, and shows clearly that there was no significant difference during the first four weeks. In view of this result, subsequent litters were given diets containing 40 per cent. sucrose and 25 per cent. maize starch.

TABLE III
THE LIVE-WEIGHT GAINS OF PIGS FED DIETS CONTAINING SUCROSE OR LACTOSE

Treatment	Number of pigs	Average live-weight (lb.)				
		Birth	1 week	2 weeks	3 weeks	4 weeks
Sucrose	9	2·9	5·8	7·0	8·2	12·2
Lactose	9	2·8	5·6	6·9	8·5	13·0

The Protein Content

Experiments reported by Sewell, Sheffy, Eggert & Loosli (1953) indicated that baby pigs grow fastest on a diet containing 32 per cent. protein. However, Becker, Ullrey & Terrill (1954) found that for pigs of 3 to 28 days of age a protein level of 22 per cent. gave as good a growth rate as higher levels. When using casein as the sole source of protein, Reber, Whitehair & MacVicar (1953) reported that a diet containing 41 per cent. protein produced maximum weight gains in pigs up to 24 days of age. In order to determine the best level of protein under the conditions of the present study, 89 pigs were removed from their sows at 24 hours of age, divided into three groups similar in weight, sex, and litter-mate distribution, and allocated three different levels of protein. The diets are shown in Table IV. Table V gives the average individual weights of the pigs of the three groups at birth, four weeks, and eight weeks of age, and from this it will be seen that there was no significant difference between the groups.

It is possible that had the diets used in this study been of a higher calorific density, the higher protein levels would have resulted in greater bodyweight gains. When Becker *et al.* (1954) found that a protein level of 22.4 per cent. gave as good a growth as levels at 26.5 or 30.6 per cent., their diet contained only 5 per cent. of corn oil. However, when Sewell *et al.* (1953) reported that levels of 32 per cent. protein gave better growth rates than levels of 16, 20, 24, or 28 per cent., they were adding 24.63 per cent. of lard to their diets. The different biological values of the proteins used by various workers may also partially account for the contradictory results obtained.

In a pilot trial to test whether increasing the calorific density of the diets would alter the pig's reaction to different protein levels, a litter of eight

TABLE IV
DIETS USED TO TEST THE EFFICACY OF DIFFERENT LEVELS OF PROTEIN

	Diets number		
	1	2	3
Casein, lb.	13	20	27
Sucrose, lb.	39	32	25
Maize starch, lb. ...	25	25	25
Dried whole milk, lb. ...	15	15	15
Yeast, lb.	5	5	5
*Minerals, lb.	3	3	3
Vitamin A, I.U. per lb.	7,200	7,200	7,200
„ D, „	1,800	1,800	1,800
α-tocopherol acetate mg.	250	250	250
Penicillin, g. per lb. ...	0·014	0·014	0·014
Protein, per cent. ...	20	27	34

At 3, 7 and 17 days of age 100 μg. of vitamin B_{12} was injected intramuscularly into each animal and the equivalent of 500 mg. of reduced iron was given as a paste.

* This was a proprietary mineral mixture containing calcium 17·4 per cent., phosphorus 11·4 per cent., sulphur 0·75 per cent., iron 0·24 per cent., sodium chloride 30·0 per cent., copper 1,800 p.p.m., cobalt 300 p.p.m., manganese 510 p.p.m., iodine 240 p.p.m.

TABLE V
THE AVERAGE INDIVIDUAL LIVE-WEIGHTS OF PIGS GIVEN THREE DIFFERENT LEVELS OF PROTEIN

	Protein, per cent.		
	20	27	34
Number of pigs	28	30	31
Weight at birth	2·8	2·7	2·8
„ 28 days	11·8	11·6	11·5
Number taken to 56 days ...	14	16	18
Weight at 56 days	35·7	33·0	32·5

pigs was caged at 72 hours old and fed diet No. 3 shown in Table IV, except that 10 per cent. of the sucrose had been replaced by lard. These animals averaged 39.4 per cent. at eight weeks of age as compared with the 32.5 per cent. reached at that age by the pigs fed diet No. 3. This indicates that the calorific density of the diet may have a considerable influence on the optimal protein level.

The Antibiotic Content

It is usual to include some form of antibiotic in baby-pig diets. In the diets of three of our earliest litters no antibiotic was included, but because there was a high incidence of diarrhoea and subsequent mortality, either penicillin or chlortetracycline* have always been included in subsequent diets. Three litters, totalling 26 pigs, were removed from their sows at 48 hours old and divided into two similar groups to compare the effects of either penicillin or chlortetracycline in the diet. The penicillin was used at the 0.0003 per cent. level, and the chlortetracycline at the 0.0025 per cent. level. There was no significant difference between the growth rates of the two groups and at 56 days of age the penicillin group averaged 35.6 lb. in weight while the chlortetracycline group averaged 34.2 lb.

* Aureomycin.

To determine whether increased growth rates would result from increased levels of an antibiotic in the diet, 21 pigs were fed a diet containing 0.01 per cent. of chlortetracycline. These pigs grew well to average 11.8 lb. at three weeks of age, but at this stage they developed a very marked diarrhoea and declined both in appetite and growth rate. The diarrhoea was afebrile and did not respond to normal treatment. In view of the report by Quinn (1952) of a similar condition in pigs, cultural examinations were made from the faeces. These showed that in addition to various strains of *Bacterium coli* and *Proteus vulgaris*, which could be considered normal inhabitants of the gut, an atypical *Bacterium aerogenes* was present. Also isolated were a relatively large number of yeasts, mainly *Candida brumptii* and *Torulopsis candida*, and in some instances these predominated in the cultures. In addition, other fungi were occasionally isolated in the forms of a species of *Penicillium* and a *Mucor*.

Some doubt was cast on the significance of these findings, when, in a small experiment in which chlortetracycline-fed baby pigs were sampled together with controls kept in neighbouring pens, no significant differences could be found in the bacterial and fungal flora of the faeces. However, in one of the chlortetracycline-supplemented pigs which died, a severe diphtheritic enteritis was found, particularly involving the caecum, colon, and rectum. On culture from the affected areas numerous yeasts were isolated in addition to *B. coli* and *P. vulgaris*. Although these findings do not completely incriminate the yeast infection as the cause of the diarrhoea, it is interesting to note that under similar circumstances a yeast has been found to cause thrush in a piglet (Osborne, 1955).

In the group of 21 pigs the diarrhoea gradually lessened in severity, but by the time the animals were six weeks of age they showed a marked disinclination to stand or move about, assuming a typical " dog-sitting " attitude. At eight weeks old eight of them were paralysed in their hind limbs. Two were killed at this stage and *post-mortem* examination revealed no gross abnormality in any organ. The musculature appeared normal, but histological examination of the sciatic nerve in the mid-thigh region showed degeneration of a considerable number of fibres with the presence of myelophages (Figs. 1 and 2). There were also degenerative changes in the spinal cord (Figs. 3 and 4) and to a lesser degree in the median nerve. The appearances were those of an advanced peripheral neuritis, such as is known to occur in vitamin B_1 deficiency (Field, 1955). It is well recognised that the oral administration of antibiotics to human beings may induce a deficiency of thiamine even when diets normally adequate in this vitamin are fed. For this reason oral antibiotic preparations are often accompanied by vitamin B-complex supplements. This practice is, of course, not followed when antibiotics are fed to live-stock, since the levels used are normally considerably lower than those needed as a therapeutic dose. However, the results of the present study indicate that on diets containing normally adequate levels of thiamine (5 per cent. yeast) deficiency

FIG. 1.—Longitudinal section through sciatic nerve of paralysed pig. Note disintegration of myelin sheaths throughout the thickness of the nerve. Frozen section. Sudan Black. × 170.

FIG. 2.—High power view of same nerve showing disintegrated myelin present as droplets. Many of these droplets are within phagocytic cells. Staining as in Fig. 1. × 830.

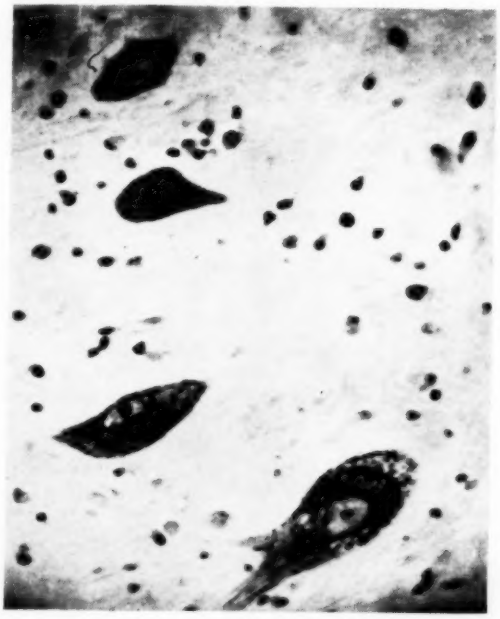

FIG. 3.—Transverse section of lumbar cord of paralysed pig. Showing a cluster of relatively normal anterior horn cells. That at the bottom contains well preserved Nissl substance. The middle two are undergoing early chromatolysis. Zenker/Giemsa. × 318.

FIG. 4.—Transverse section of lumbar cord of paralysed pig. Showing another cluster of anterior horn cells in which chromatolysis is more advanced so that the cytoplasm has become hyalinised. The top right hand cell shows a single vacuole. Zenker/Giemsa. × 318.

symptoms may be induced if too high a level of chlortetracycline is used.

Although the pigs which were suffering from the paralysis were then fed diets low in chlortetracycline and high in the vitamin B-complex, and were given intramuscular injections of thiamine and vitamin B_{12}, only three of them fully recovered the use of their limbs. Presumably the nervous degeneration in the others had proceeded to an irreversible stage before the treatments were introduced. However, although the paralysis of the hind limbs continued, the pigs otherwise returned to normal and food intakes and growth rates were good. The appearance of the pigs was also good, and they were eventually marketed as porkers.

The Iron Content

The importance of iron in the nutrition of the baby pig is now well recognised, even though an iron-deficiency anaemia still occurs frequently in young pigs under farm conditions. It is known that 10 to 15 mg. of iron daily are sufficient to maintain adequate levels of haemoglobin in pigs during the first six weeks after birth. There are, however, different ways of administering the iron. At the start of this work, the method adopted was of three intramuscular injections, each of 100 mg. of iron, as ferric phosphate in suspension, at weekly intervals, the first being given at 48 hours old. As has been reported (Tribe, 1954) this method proved to be unsatisfactory, and did not maintain haemoglobin levels or prevent deaths due to anaemia. This finding has since been confirmed by Barber, Braude & Mitchell (1955), Brownlie (1955), and McDonald, Dunlop & Bates (1955), who also showed that a more recent injectable preparation of iron as an iron dextran complex is satisfactory as an anaemia preventative. However, in the present study it was found to be most convenient to put the iron, as ferric citrate, in the food at the 0.32 per cent. level, and this proved to be satisfactory.

The Vitamin E Content

For some time no vitamin E supplement was used in these studies. In one experiment, however, a litter of six pigs was kept on the semi-synthetic diet until it was 14 weeks of age, and, although all the animals apparently progressed normally, two of them suddenly died at this stage. *Post-mortem* examinations revealed nothing very positive except that the heart wall showed degenerative changes with some loss of striation in most areas. The muscles of the hind limbs were also outstandingly pale, although in neither pig were there signs of anaemia. In case this should have been the consequence of a vitamin E deficiency, two litters totalling 21 pigs were divided into two groups of similar weight, sex, and litter-mate distribution, and fed the standard semi-synthetic diet already described from 24 hours of age. One group received a supplement of 40 mg. α-tocopherol acetate per pig per day and the other received no supplement. The growth of both groups was similar until the experiment ended after 56 days, but one pig of the non-supplemented group died of heart failure after 36 days. Although apparently not anaemic, the limb muscles were exceptionally pale, and the left latissimus dorsi was almost white in some areas. This was regarded as inconclusive evidence upon which to incriminate vitamin E, and therefore an attempt was made to induce a vitamin E deficiency in young pigs in order to study the changes that were brought about.

A litter of eight pigs was individually caged at 24 hours of age and fed the following diet; skimmed milk powder, 100 g.; lard, 50 g.; McCollum's salt mixture No. 185 (with iron), 1.5 g., and cod-liver oil, 4.5 ml. These quantities were made up with water into a litre of milky liquid, kept at body temperature, and fed in the quantities and frequencies recommended by Dyrendahl *et al.* (1953). Four of the pigs were each also given 40 mg. of α-tocopherol acetate per day in tablet form. This diet was based on that used by Blaxter, Watts & Wood (1952) in their vitamin E studies on calves. When the pigs were killed at 42 days of age, the vitamin E content of the blood averaged 0.33 mg. per 100 ml. for the supplement group and 0.08 mg. per 100 ml. for the unsupplemented group. Table VI gives the weights of the pigs and of their different organs, and from this it will be seen that there was no significant difference between the two groups. Also a histological examination of the livers, hearts, kidneys, and testicles revealed no differences nor any abnormalities. Two of the pigs in each group were females, and Dr. T. Moore kindly examined the uteri and reported that they were all of normal colour and fluorescence. The teeth of all the pigs were also normal in appearance. In view of these results it seems to be unnecessary to feed a vitamin E supplement in experiments of this nature which last only for about six weeks duration.

Miscellaneous Ingredients

The importance of supplying water without stint to baby pigs cannot be over-stressed. During the first 12 hours after removal from the sow, pigs will eat or drink little food, but drink water freely. If water is not available all the time, baby pigs will readily die of dehydration.

Throughout these studies two mineral supplements have been used, both with satisfactory results. The first was used at the 5 per cent. level and consisted of: ferric citrate, 6.4 per cent.; sodium chloride, 4.5 per cent.; magnesium sulphate, 11.0 per cent.; sodium dihydrogen phosphate, 9.0 per cent.; potassium phosphate, 24.7 per cent.; calcium phosphate, 14.0 per cent.; and calcium lactate, 30.4 per cent. This mixture, however, is needlessly expensive for work in which consideration of the mineral nutrients is not specifically involved. For more general studies we used a proprietary mineral mixture originally designed for dairy-cow feeding which is much cheaper and has the following analysis: calcium, 17.4 per cent.; phosphorus, 11.4 per cent.; sulphur, 0.75 per cent.; iron, 0.24 per cent.; sodium chloride, 30.0 per cent.; copper. 1,800 p.p.m.; manganese, 510 p.p.m.; cobalt, 300 p.p.m., and iodine, 240 p.p.m. This was used at the 3 per cent. level and in addition

TABLE VI
THE AVERAGE INDIVIDUAL LIVE-WEIGHTS OF PIGS, TOGETHER WITH THE AVERAGE WEIGHTS OF SOME OF THEIR ORGANS, WHEN FED DIETS WITH OR WITHOUT VITAMIN E FOR 42 DAYS

Group	Number of pigs	Live-weight (lb.)		Weight in grammes				
		Birth	42 days	Liver	Kidney average	Heart	Spleen	Testicle average
+E	4	2·7	24·8	221	17·5	23·2	11·1	6·0
−E	4	2·8	26·0	238	17·1	25·6	11·6	4·4

500 mg. of reduced iron was given orally to each pig during the first week of life.

On a number of occasions our baby pigs have scoured, although not badly and apparently without ill effects. It may be the total lack of fibre in our diets has been responsible for this, and in diets of the most recent litters, 4½ per cent. dried grains has been included as a possible remedy. It is our impression that this has decreased the incidence of scours.

The high incidence of hypoglycaemia among some of the earlier litters, producing a 60 per cent. mortality in some cases, was a matter of concern. The injection of 10 ml. of 10 per cent. glucose in normal saline both subcutaneously and intraperitoneally into the pig at the time of removal from the sow proved ineffective as a preventive measure. However, it was found that if great care was taken to avoid chilling the pigs at the time of their removal from the sow, and pen temperatures of 80° F. were maintained during the first three days of life, hypoglycaemic comas did not occur.

Balantidium coli Infection

One of the advantages of this early weaning technique is the opportunity it affords of maintaining pigs in an hygienic environment free from the risk of any infection. Not uncommonly, however, we have had pigs of two to three weeks of age develop a serious diarrhoea, often haemorrhagic, with an associated decline in appetite and growth rate. Six such animals have been killed and *post-mortem* examinations have shown all of them to be emaciated, but only slightly anaemic. The significant lesion has been a severe diphtheritic or ulcerative caecocolitis with pale granulation tissue at the base of the ulcerated areas. In many cases *Balantidium coli* has been demonstrated.

Although *Balantidia* are the most widespread of protozoan parasites of the pig, they are not usually regarded as important in the aetiology of baby pig scours. However, it is known (Spindler, 1942) that pigs may become infected immediately after birth, that symptoms of intestinal disorders may appear within 14 days after infection, and that a diet rich in starch provides conditions favourable to the organism. Thus conditions such as those of the present study are calculated to increase the risk of balantidial infection. Once a pig is infected, it is very difficult to treat. Oral administration of 0.12 g. streptomycin sulphate combined with 1 g. of sulphaguanidine was tried over a period of several days and also a course of treatment using mepacrine hydrochloride B.P., in doses of 0.025 g. three times a day for four days. Neither of these treatments was successful. In most cases the symptoms ceased in about three to four weeks provided that the pens were frequently cleaned, but in a minority of cases the condition proved fatal. Spindler (1942) has said that the only method of treatment is to put the infected pigs on to a diet of cow's milk exclusively for about a week. This was tried and found to be effective.

Management of the Sow

Throughout this study most of the litters used were home-bred, and therefore it has been possible to collect a certain amount of information concerning the breeding behaviour of the sows. The sizes of successive litters produced by nine sows are shown in Table VII, from which it will be seen that the number of pigs born did not alter significantly between litter numbers 1 to 5. Table VIII gives the number of baby pigs that died between birth and early weaning. The average mortality between early weaning and 56 days was 15 per cent. so the over-all mortality between birth and 56 days approaches the accepted figure of 20 per cent. for normal rearing. Therefore it is probably incorrect to claim a reduced mortality rate as an advantage of the early weaning method.

From the results given in Table IX, it will be seen that for all the sows whose litters were removed at under 72 hours, a total of 27 litters, an average time of 21 days elapsed between parturition and conception.

The sows were housed in individual wooden huts with free access to pasture. During pregnancy their ration of balanced nuts was increased from 2½ to 7 lb. per day. About three days before farrowing was anticipated they were placed in a wooden pen equipped with farrowing rails. As soon as its litter had been removed each sow was given a greatly reduced ration of food and water for 48 hours, and during this time the milk supply invariably dried up with no difficulty. Four days after parturition, the sows were run at grass with a boar, and when mating had been observed they were placed in the wooden huts again.

Summary

A three-year study is described in which 314 pigs were removed from their sows between 24 and 72 hours of age, and subsequently reared on semi-synthetic diets. The compositions of the diets used are discussed and the general methods of housing and management are described.

TABLE VII
SHOWING SIZE OF SUCCESSIVE LITTERS

Sow Number	Sow Breed	Total number of baby pigs farrowed — Litter number 1	2	3	4	5	Average
1	Wessex	8	10	5	9	8	8·00
2	"	8	10	11	11	11	10·20
3	"	10	8	8	7	Culled	8·25
4	"	14	12	11	12		12·25
5	"	10	8	9	12	11	10·00
6	Large White	8	10	11	5	13	9·40
7	" "	11	10	Culled			10·50
8	" " × Wessex ...	14	14	9	12	7	11·20
9	" " × " ...	9	12	10	10	19	12·00
Average		10·22	10·44	9·25	9·75	11·5	10·2

TABLE VIII
SHOWING THE NUMBER OF PIGS IN EACH LITTER WHICH DIED BETWEEN BIRTH AND EARLY WEANING

Sow Number	Sow Breed	Mortality between birth and weaning — Litter number 1	2	3	4	5	Average
1	Wessex	2	0	4	0	1	1·4
2	"	0	0	0	3	2	1·0
3	"	0	4	0	2		1·5
4	"	2	2	2	0		1·5
5	"	2	0	0	2	2	1·2
6	Large White	2	1	2	1	2	1·6
7	" "	3	2				2·5
8	" " × Wessex ...	2	3	2	3	2	2·4
9	" " × " ...	1	0	0	0	3	0·8
Average		1·5	1·3	1·2	1·4	2·0	1·5

TABLE IX
INTERVAL IN DAYS BETWEEN PARTURITION AND CONCEPTION

Sow Number	Sow Breed	Litter number 1	2	3	4	5	Average
1	Wessex	13	14	15	18[1]	12	14·4
2	"	20[2]	17	15	13	21	17·2
3	"	•	14	13			13·5
4	"	25[3]	15	14	•		18·0
5	"	•	14[4]	28	11	16	17·2
6	Large White	25	52	16[1]	36	54	36·6
7	" "	58					58·0
8	" " × Wessex ...	34	12	10	14[3]	34[5]	10·8
9	" " × " ...	11	•	13	•	10	21·3
Average		26·6	19·7	15·5	18·4	24·5	20·9

• Litter reared normally on sow.
[1] Litter weaned at 10 days.
[2] Litter weaned at 14 days.
[3] " " 6 "
[4] Litter weaned at 11 days.
[5] Sow treated for agalactia after farrowing.

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We would particularly like to record our appreciation of the help and encouragement that was received at all times from the late Professor Blakemore.

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The Treatment of Carriers of *Salmonella pullorum* and *Salmonella gallinarum* with Furazolidone

BY

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IN an earlier paper (Wilson, 1955a) describing the effect of furazolidone in artificially produced infections in young chicks with *S. pullorum*, *S. gallinarum*, and *S. typhi-murium*, a brief reference was made to the treatment of adult "carriers." The results obtained differed from those of Gordon & Tucker (1955) who reported that following treatment with furazolidone 0.02 per cent. for 10 days, three of four birds showed no evidence of *S. pullorum* or other salmonella infection at autopsy, while two of the birds showed a marked reduction in serum titre. When the concentration of the drug was increased to 0.04 per cent., seven of the nine treated birds became negative to the serum tube agglutination test between 60 and 84 days after the cessation of treatment, and of these, eight were subsequently found to be free from *S. pullorum* infection.

In our hands treatment with the drug was not followed by a significant reduction in titre, and *S. pullorum* was isolated from all the treated birds. Salmonella were not, however, isolated from any of the eggs laid by treated birds. The present paper describes a continuation of this work.

Materials and Methods

The carriers of *S. pullorum* were naturally affected birds detected at the routine blood testing of a flock participating in the Accredited Poultry Scheme. Carriers of *S. gallinarum* were survivors of an artificially induced outbreak of fowl typhoid. All birds were kept under observation for from two to three months before dosing, and were subjected to weekly agglutination tests by the tube and rapid whole-blood methods. It can be assumed that in practice carriers detected by the agglutination test which were to be treated would be segregated and held in a pen during treatment and pending retesting. Accordingly, the earlier experiments were conducted on these lines so that the results obtained might be regarded as valid under field conditions. Carriers were kept in small groups and after the period of observation described, were dosed by administering furazolidone* 0.04 per cent. in the mash for 12 consecutive days. During the period of treatment all other foods were withheld, but the birds had constant access to the medicated mash which was fed dry. In view of the disappointing results of treatment, to obviate the risk of reinfection or cross-infection which it was considered might be responsible, in later experiments all birds were kept in individual cages on wire floors, within an isolation unit. This had no effect on the results of treatment.

During the period of observation, in addition to weekly blood testing, the yolks of all eggs laid were cultured in Selenite F medium (Hobbs & Allison, 1945) and examined for the presence of salmonella by the usual procedures. A number of untreated carriers were kept as controls. At the end of the period of observation, all birds were destroyed, autopsied, and subjected to bacteriological examination. In birds in which there were obvious lesions, *e.g.* distorted ovules, pericarditis, or myocarditis, direct cultures were made on blood agar and MacConkey medium, and the affected organ or organs, normal ovules, liver, spleen, gall bladder, and intestines cultured in Selenite F. To obviate any possibility of bias, blood samples and eggs were examined by different workers who were kept unaware of their respective sources, whether from treated or untreated birds, and neither worker was ever informed of the date of commencement and cessation of treatment. To still further ensure impartiality from time to time a control bird was treated. A similar procedure was adopted for the bacteriological examination of the birds and it was only when the experiment was over that the respective findings were correlated.

The effect of treatment on the agglutination titre of carriers of *S. pullorum* and *S. gallinarum*

Eight carriers of *S. pullorum* and 18 carriers of *S. gallinarum* were treated. The results are in Table I.

As the period of observation before treatment varied from two to three months or longer, and interval between dosing and final bleeding, just before the bird was destroyed for bacteriological examination varied from 2 to 32 weeks, it is impossible to include all the titres. A selection of 15 has been made; those for the three weeks preceding dosing, the 11 weeks following dosing, and the final titre. Over all there was no significant reduction in titre in the treated

* Neftin.

Observations on the Composition of an Experimental Semi-synthetic Diet for Baby Pigs—*concluded.*

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TABLE I

EFFECT OF TREATMENT WITH FURAZOLIDONE 0·04 PER CENT. FOR 12 DAYS ON THE AGGLUTINATION TITRE OF CARRIERS OF *S. pullorum* AND *S. gallinarum*

Bird No.	Before treatment (weeks) 3	2	1	After treatment (weeks) 1	2	3	4	5	6	7	8	9	10	11	Titre when killed	Interval between dosing and killing	Bact. exam.	Organism
1727	320	320	320	320	80	160	160	160	160	320	320	320	640	320	160	32	+	*S. pullorum*
780	80	20	20	80	40	40	80	80	40	80	80	160	160	160	160	32	+	"
1705	80	160	160	320	160	80	80	160	160	160	160	320	160	160	160	21	+	"
1226	80	80	80	160	80	80	40	80	20	40	40	40	40	40	40	18	+	"
1229	80	80	80	80	80	80	80	80	20	80	20				20	8	+	"
1711	80	80	80	80	80	40	20	40	20	80	80				80	8	+	"
1223	80	160	80	160	80	40	40	40	20	40					'40	7	+	"
1221	20	20	20	40	40	40	20	20	10	10					10	7	+	"
149	40	40	40	40	80	80	160	80	40	80	80	80	160	160	40	32	+	*S. gallinarum*
1605	40	80	320	640	320	160	320	320	320	160	320	320	320	320	40	32	−	"
1486	80	80	80	80	40	40	80	80	80	40	80	80	80	80	40	19	+	"
108	80	80	80	80	40	40	40	40	20	40	20	40	20	40	40	18	−	"
1719	40	40	40	20	20	20	20	40	20	20	40	40	40	40	20	18	+	"
1702	20	20	40	80	10	10	10	10	10	10	80	40	40	40	40	14	+	"
1969	40	40	80	80	80	20	20	80	640	640	640	640	1,280	640	640	14	+	"
1920	40	40	80	80	80	80	20	80	80	160	320	160	160	160	320	14	+	"
1493	10	10	10	20	10	10	10	10	10	10	10	—	10	—	20	14	−	"
1715	20	20	20	40	40	20	20	20	20	20	20	20	20	20	20	14	−	"
133	40	40	20	20	40	20	40	40	20	40	40	40	20	40	40	7	+	"
2760	10	40	40	80	80	40	20	10	20						20	6	−	"
2762	80	160	80	80	80	80	40	40	40						40	6	+	"
2785	320	320	80	160	160	160	80	80	160						160	6	−	"
2748	20	10	40	20	40	20	20								20	4	+	"
2751	160	160	320	160	320	80	160								160	4	+	"
2781	160	160	320	320	160	80	160								160	4	+	"
1511	20	20	40	40	40										40	2	+	"
Untreated birds																		
1469	80	80	80	80	40	40	80	40	40	40	40	20	20	20			+	"
2780	320	80	40	40	40	20	20	40	20	10	20	40	20	20			+	"
2795	160	80	80	40	80	80	80	160	160	160	160	80	160	160			+	"
2231	80	80	80	40	80	80	80	160	80	160	160	80	160	80			+	"
2133	40	40	20	20	40	20	40	40	20	40	40	40	40	40			+	"
2711	80	80	80	80	80	80	80	160	160	160	320	160	80	80			+	"
2721	20	20	10	40	40	40	40	40	10	20	20	20	20	20			+	"
2732	40	40	40	20	20	40	40	20	40	20	40	20	20	40			+	"
2769	80	80	80	80	160	160	320	320	160	160	160	160	160	160			+	"
1706	160	160	160	160	160	160	160	160	160	160	80	160					+	"
2752	160	320	160	40	40	80	80	80									+	"
1720	80	80	80	80	80												+	"

All the above birds were female except 1486

birds. In several there was a temporary lowering of the agglutinin level but after a few weeks in most cases the titre had returned to its former level. In a few birds the titre rose after dosing. Although all treated birds continued to react to the end of the experiment, as salmonella were not isolated from six birds, it must be assumed that if the period of observation had been lengthened the titre would have disappeared in these cases and possibly in some others in which it was very low.

Effect of treatment on persistence of *S. pullorum* and *S. gallinarum*

Bacteriological examination of the birds at the end of the experiment showed the presence of *S. pullorum* in all the eight treated birds previously infected with this organism and of *S. gallinarum* in 12 of the 18 " carriers " of this germ.

Detailed results of the isolations from the various organs of individual birds are in Table II in which are also included for comparison the results of bacteriological examination of six non-treated fowls.

In 10 of the 20 carriers in which salmonella persisted after treatment, the organism was isolated from the distorted ovules only; the other organs, including normal ovules present in the ovary, appeared to have been sterilised. Salmonella were isolated from three sites or more in only 4 of 26 treated birds, whereas positive cultures were obtained from three or more sites in four of the six control fowls. In the only male bird treated, *S. gallinarum* persisted in the heart lesions.

Effect of treatment on egg transmission of *S. pullorum* and *S. gallinarum*

Several birds in which the ovary was subsequently found to be completely degenerate did not lay an egg during the period of observation, and a few of the caged birds developed the vice of egg-eating. This limited the number of eggs available for bacteriological examination, nevertheless sufficient were obtained to show that before treatment with furazolidone at least 10 of the 25 experimental hens were laying eggs containing either *S. pullorum* or *S. gallinarum*,

TABLE II
RESULTS OF BACTERIOLOGICAL EXAMINATIONS OF FOWLS TREATED WITH FURAZOLIDONE

	Bird	Distorted ovules	Normal ovules	Liver spleen gall bladder	Oviduct	Heart	Intestines	Result	Organism
Treated	1727	+						+	*S. pullorum*
	780	+						+	"
	1705	+		+			+	+	"
	1226	+						+	"
	1229	+	+	+				+	"
	1711	+						+	"
	1223	+						+	"
	1221	+			+			+	"
	149	+						+	*S. gallinarum*
	1605							−	"
	1486					+		+	"
	108							−	"
	1719			+				−	"
	1702	+						+	"
	1969	+						+	"
	1920	+						+	"
	1493							−	"
	1715							−	"
	133	+						+	"
	2760							−	"
	2785	+		+		+		+	"
	2762	+						+	"
	2748							−	"
	2751	+				+		+	"
	2781	+						+	"
	1511	+		+		+	+	+	"
Control	1469	+				+	+	+	"
	2780	+		+			+	+	"
	2795	+		+		+		+	"
	2752	+		+		+		+	"
	1706	+						+	"
	1720	+				+		+	"

and that after treatment only one continued to do so, and that on a greatly reduced scale. Figures for individual birds are in Table III.

Discussion

The results of treatment with furazolidone of "carriers" of *S. pullorum* and *S. gallinarum* differ from those of Gordon & Tucker (1955). It is difficult to suggest a reason for this. It might be considered that the types of fowls used are not strictly comparable in that the "carriers" of *S. gallinarum* used here were products of artificially induced infection whereas those quoted by the former authors were field cases. This does not provide an explanation, however, as treatment was more effective in carriers of *S. gallinarum* than in carriers of *S. pullorum*, which are strictly comparable with the birds used by Gordon & Tucker.

While there was a distinct drop in titre in many of the treated birds, in most cases it was of a temporary nature and after a few weeks the titre resumed its former level and sometimes exceeded it. Had the period of observation after dosing been extended, however, at least six of the treated birds from which salmonella were not isolated, would have ceased to react. In five of these birds the titres were low even before dosing; in two it was 80, in two it was 40, and in one it was 20. In the remaining bird (1605) a titre of 320 before dosing was more or less maintained during the period covered by Table I. As long as 19 weeks after dosing it was 640, after which time it steadily fell over a period of five weeks to 80. By

TABLE III
BACTERIOLOGICAL EXAMINATION OF EGGS FROM CARRIERS OF *S. pullorum* AND *S. gallinarum* BEFORE AND AFTER TREATMENT WITH FURAZOLIDONE

	Before treatment		After treatment		
Birds	eggs laid	+ eggs	eggs laid	+ eggs	Organism
1711	33	16	34	0	*S. pullorum*
1223	26	8	28	0	"
1221	10	0	15	0	"
1226	4	0	29	0	"
133	20	0	30	0	*S. gallinarum*
1969	19	12	0	0	"
108	7	0	58	0	"
1719	1	0	33	0	"
149	8	0	67	0	"
1605	0	0	35	0	"
2781	14	4	6	0	"
2748	30	4	11	0	"
2762	15	13	22	2	"
2760	16	8	24	0	"
2751	2	1	5	0	"
2779	9	2	26	0	"
2732	5	0	25	0	"
2743	4	1	18	0	"
	223	69 30·9%	466	2 0·4%	

the 28th week it had risen again to 320 after which it gradually declined to 40 at the end of the 32nd week when the bird was destroyed. It is considered that the fall in titre and failure to isolate *S. gallinarum* from this bird is associated with natural recovery rather than the result of treatment nearly eight months earlier. The persistence of agglutinins after treatment with furazolidone has also been noted in the field; 19 birds from three flocks in which reactors were still positive after treatment were subjected to bacteriological examination and salmonella were isolated from 18.

That furazolidone exerts a considerable bactericidal effect on *S. pullorum* and *S. gallinarum* in "carriers" is seen by a comparison of the results of bacteriological examinations of treated and untreated fowls (see Table II). The six negative cases have been discussed earlier. In the others the distribution of the surviving salmonella is more localised; in 10 cases infection was confined to the distorted ovules in the ovary. In only two treated birds could persisting infection be termed widespread whereas in half the untreated controls this was so. It would appear either that the salmonella in the distorted ovules are too numerous to be completely overcome by the action of furazolidone or that possibly as a result of a diminished blood supply to the diseased ovules the drug may not be available in sufficient concentration. Its effect on the organism elsewhere in the ovary is profound. After a course of treatment salmonella were rarely recovered from apparently normal ovules and were isolated from only two of over 450 eggs laid by the treated birds. Both positive eggs were from the same bird, which during the three weeks prior to dosing with furazolidone laid 15 eggs from 13 of which *S. gallinarum* was isolated. During the four weeks following treatment it laid 22 eggs of which the two positive were the 20th and 21st of the sequence. It seems probable that if this bird had lived it again would have become a regular producer of positive eggs.

The proportion of positive eggs laid by reactors varies. Moore (1946) isolated *S. gallinarum* from 9 per cent. of eggs from a pen of 21 fowl typhoid reactors. Simms (1946) reported that 10 per cent. of eggs laid by fowls artificially infected with fowl typhoid and 4 per cent. of eggs laid by natural carriers contained *S. gallinarum*, and Hall, Legenhausen & Macdonald (1949) recorded an average of 6 per cent. of infected eggs from a reactor flock. Wilson (1955b) found 108 positive eggs out of 1,843 eggs laid by 21 carrier fowls. Individual production of infected eggs varied from 5 to almost 40 per cent. with an average of 18 per cent. Bird 2762 must therefore be regarded as an abnormally high producer of infected eggs; this may account for its exceptional response to treatment.

The results of the laboratory tests and the field experience quoted, reveal the usefulness and limitations of furazolidone in the treatment of carriers of *S. pullorum* and *S. gallinarum*. Its administration will result in a proportion of birds being sterilised of salmonella and ultimately becoming negative to the agglutination test; a larger percentage will continue to harbour the organism, mostly in the distorted ovules, and will remain reactors. It is likely, except in exceptional cases, that treated birds will cease laying eggs containing salmonella. This may well prove the most valuable property of the drug in the treatment of carriers. It would be useful in an infected flock from which reactors had been removed, in which it became necessary to incubate eggs before retesting was completed; this can be quite a lengthy period as two clear tests are often desirable. Furazolidone may prove even more valuable in the prevention of salmonellosis (disease caused by other salmonella than *S. pullorum* and *S. gallinarum*) in turkeys and ducks, which often presents a difficult problem as in these species direct egg transmission, rare in the domestic fowl, is not uncommon. It must be borne in mind, however, that furazolidone is not as effective in chicks infected with *S. typhi-murium* as with *S. pullorum* or *S. gallinarum* (Wilson, 1955), so that proof of its usefulness in other salmonella must await the result of critical experimentation.

Conclusions

1. The feeding of furazolidone 0.04 per cent. in the mash continuously for 12 days to birds which gave positive results to agglutination tests for *S. pullorum* by both tube and rapid methods, failed in most cases to cause a significant or permanent lowering of the agglutination titre. None of the birds ceased to react as a result of treatment.

2. In 20 of 26 treated carriers, salmonella persisted after treatment. Distorted ovules were the commonest site of remaining infection.

3. Treatment had a marked preventive effect on the laying of infected eggs; only two of 466 eggs laid after treatment contained salmonella. On this account it is suggested that the drug may be particularly useful in the prevention of salmonellosis in turkeys and ducks.

Acknowledgments.—I wish to express my thanks to my colleagues, Messrs. R. H. Duff, M.R.C.V.S., D. B. Lee, F.I.M.L.T., B. McIntosh, and Miss Macdonald, A.I.M.L.T., for their valuable assistance, and to my colleagues in the Animal Health Division for their help in field trials.

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THE ALBERT SCHWEITZER MEDAL

Major C. W. Hume, director of the Universities Federation for Animal Welfare, which he founded in 1926 as the University of London Animal Welfare Society, has been awarded the Albert Schweitzer Medal of the American Animal Welfare Institute and a cheque for $500 in recognition of his services to the welfare of laboratory animals.

The International Association of Veterinary Food-Hygiene

The first Symposium of the International Association of Veterinary Food-Hygiene was held in Utrecht from August 27th to September 1st, and was supported by representatives from 27 different countries as follows:—

Algeria (2), Austria (2), Belgium (7), Denmark (9), Egypt (1), Finland (3), France (8), Germany (26), Great Britain (6), Greece (1), Ireland (3), Iran (2), Israel (1), Italy (5), Kenya (1), Luxembourg (1), Netherlands (53), Yugoslavia (6), Norway (5), Poland (1), Spain (3), Sweden (21), Switzerland (11), Taiwan (1), Czechoslovakia (2), U.S.A. (2), and U.S.S.R. (3).

On the first day the official opening was followed in the morning by a lecture by Dr. Lerche, of Berlin, on "The Position of the Veterinary Surgeon in Relation to Food Hygiene." In the afternoon Mr. H. Thornton, the official delegate of the British National Committee for International Veterinary Congresses, lectured on "Principles of Meat Hygiene," followed by contributions from representatives of the Netherlands, U.S.A., Austria and U.S.S.R. A discussion followed, after which further papers were read by representatives of Yugoslavia, Germany, Switzerland and Kenya.

In his lecture Mr. Thornton said that the study of meat hygiene must commence with the live animal, for the quality, durability and even safety of the meat was influenced by the treatment the animal received between leaving the farm and being slaughtered. Reference was made to the effect of rest, feeding and watering, and to some problems still to be solved.

Methods of slaughter were discussed, and reference made to the slaughter of animals without preliminary stunning, and the techniques by which it was possible to assess the amount of blood passing through the brain after animals were so slaughtered. Mr. Thornton also spoke about the period which elapsed before unconsciousness supervened.

The basic principles of routine *post-mortem* inspection were reviewed with particular reference to examination of the carcase for evidence of tuberculosis. Attention was drawn to the wide differences which existed in the various codes of judgment in relation to carcases affected with tuberculosis and to other diseases. Laboratory tests as an aid to routine *post-mortem* inspection were reviewed, and the need was stressed for tests of a simple practical nature.

We hope to summarise this and other papers after they have been published in the official Proceedings.

The following day was spent on a whole day excursion to the Frico dairy export plant in Leeuwarden.

On the Wednesday morning the general lecture was on "The Principles of Bacteriological Examination of Foods," by Professor Nevot, from France. It was followed by papers from representatives of Germany, Poland, Sweden and France. After discussion further papers were read by representatives of the Netherlands, Norway and Sweden.

In the afternoon Dr. Gisske lectured on "Principles of Meat Preservation," followed by papers by representatives of the Netherlands, France, Germany, Yugoslavia and Austria.

"Principles of Fish Hygiene," and "The Hygiene of Eggs and Egg Products," were the principal lectures on the following morning, followed by "Principles of Milk Hygiene," and "Inspection of Poultry and Rabbits in the United States," in the afternoon.

During the week social events included a reception by the Dutch government, a civic reception by the dignitaries of Utrecht, and a reception by the Netherlands Veterinary Medical Association.

At 9 a.m. on the last morning a special meeting of official delegates was held at which a number of resolutions were presented for consideration, the statutes of the Association were approved, a committee was appointed and the location and date of the next symposium were discussed. These matters were presented to the full Plenary Session which followed. The resolutions adopted by the first meeting of the International Association of Veterinary Food Hygiene were as follows:—

That all food of animal origin (this to include meat, poultry, game, seafood, milk, eggs and their derivatives) be controlled by veterinarians.

That inspection methods and standards for food, particularly in the matter of meat-control, should be uniform in both importing and exporting countries.

That a Board be set up to attempt to determine whether standards can be established on which food-hygiene laws could be based.

Countries exporting foodstuffs, especially eggs and egg-products, should take action to ensure that these products are free from vital salmonella organisms.

Independent Chairs for Veterinary Food-Hygiene and Technology should be established at all veterinary faculties or colleges, similar to those already in existence in some countries.

All intimations concerning the calling of a symposium of the I.A.V.F.H. should be sent to government and veterinary authorities and not only published in professional periodicals.

Papers for future symposiums of the I.A.V.F.H. should take into consideration preferably new and unpublished works, critical reviews of present knowledge and topics relating to problems concerned with training, organisation and administration of meat and food hygiene.

Certain recent trends in the use of insecticides and fungicides, pharmaco-dynamic agents and antibiotics, new approaches to sterilisation etc. considered in the light of their inherent danger for milk production, should be studied by all interested countries and the results submitted to the next symposium.

It was the opinion of those attending the symposium that this first meeting had been an outstanding success and had fulfilled a long-felt want. From the outline of the subjects dealt with during the week it will be seen that the whole field was covered most comprehensively; but perhaps the most valuable feature of the meeting, as is usually the case in gatherings of this type, was that it afforded an opportunity for informal discussions between representatives of different

(*Concluded at foot of col. 1 opposite*)

Current Literature

BOOK REVIEWS

Control of Johne's Disease in Cattle, Sheep and Goats. Project No. 207 of the Organisation for European Economic Co-operation (pp. 201; illustrated). Published by the European Productivity Agency of the O.E.E.C., Paris, 1956.

This is a report of a seminar held at The Central Veterinary Laboratory, Weybridge, in 1955 to consider the control of Johne's disease. It was attended by 35 experts from 10 O.E.E.C. member countries. The report is in five parts. Part I, comprising 33 pages, presents an adequate and well-balanced review of our present knowledge of Johne's disease. The remaining four parts consist of 19 technical papers presented by the experts, each part dealing with a different aspect of Johne's disease and concluding with a summary of the discussion that arose upon it. A summary is also given of the views of the members on the control of the disease. Because of the lack of precise information on many aspects of the disease and the difficulties encountered in most approaches that have been made towards developing methods of control, all of which have been clearly pointed out in the report, this summary consists largely of indicating the lines along which future investigation should take place. Part II deals with some aspects of the bacteriology and experimental transmission of the disease. Studies by Taylor and Rankin indicated that only calves under six months of age could be infected by one dose of *Mycobacterium johnei*. Further work, however, showed that older calves could become infected when kept in an infected environment. This, together with other observations recorded in this report, indicate that, at the moment, it would be unwise to think that only calves are susceptible to natural infection. Three papers in this section confirm that *M. johnei* infection can occur congenitally. Part III deals with the epidemiology and diagnosis of Johne's disease. It is noteworthy for a comprehensive and important account by Hole of the application of the complement fixation test in the diagnosis of the disease, and of experiments to determine its value as a control measure. The technique of carrying out the test is described. Hole also presents a stimulating account of his views on Johne's disease in general. Part IV is concerned with certain aspects of Johne's disease in practice and it includes papers on the use of the Vallee and Rinjard live vaccine. Part V is devoted entirely to Johne's disease in sheep. This section, in particular, is of value for an account by Sigurdsson of controlled trials in Iceland with a dead vaccine prepared from *M. johnei* which produced an effective immunity in sheep against natural infection.

This report is undoubtedly the most comprehensive that exists dealing with Johne's disease. In general, it is outstanding for presenting the facts simply and lucidly without sacrificing any scientific accuracy. It is recommended even to the busiest of veterinary surgeons in large-animal practice.

Diagnostic Methods in Veterinary Medicine. George F. Boddie. 4th Edition, 1956. Oliver and Boyd, Edinburgh. 25s. 399 pp., 51 illustrations.

Bearing in mind the relatively small potential public for a veterinary text book, any such book which has required four editions and one reprinting in 12 years clearly supplies a real and continuing demand.

Boddie's fourth edition is presented in its familiar format outlining concisely the principles and systematics of veterinary diagnosis as applied to each anatomical system. No clinician who habitually followed the methodological approach laid down in this valuable work could fail to improve his diagnostic acumen.

The book continues to contain a number of chapters outlining certain laboratory techniques which are of aid to the clinician; thus there are chapters on Clinical Biochemistry, Bacteriology, Helminthology and Haematology, with chapters on Post-mortem Technique and Diagnosis of Poultry Diseases. In this part of the book there is a certain lack of balance: the chapter on Haematology written by Holman is excellent and could almost be described as exhaustive, especially when compared with the chapter on Bacteriology which is rather sketchy. One would have liked to have seen fuller details of agglutination tests for *Br. abortus* infection, including a mention of whey testing. Methods of examination for *V. fetus* infection and Clostridial enterotoxaemias surely deserved a place in this chapter. In the subsequent editions, which certainly will be demanded, the chapters on laboratory aids, on which the clinician is increasingly dependent, will need some expansion and further revision.

In the meantime this edition should have its place in every clinician's personal library.

ABSTRACTS

Radiographic Demonstration of Dwarf Gene-carriers in Beef Animals. EMMERSON, M. A. (1956). *J. Amer. Vet. Med. Assoc.* **128.** 381-96.

Osteochondrodystrophic-like dwarfism is genetically conditioned by a simple autosomal recessive gene and is thereby distinguished from the ateliotic

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The International Association of Veterinary Food-Hygiene—*concluded.*

countries. The importance placed by other countries on veterinary food-hygiene was shown by the support afforded from such countries as the Netherlands, with 53 representatives, and Germany, with 26 representatives.

The representatives from Great Britain were six in number and included Messrs. G. S. Ferguson, L. B. A. Grace, E. F. McCleery, J. M. Olivant, R. A. Paterson and H. Thornton.

It was decided that the next meeting of the Association should be held in conjunction with, and constitute a special section of, the forthcoming International Veterinary Congress.

Arising from the attendance of British representatives at the symposium, it has been suggested that veterinary surgeons who are interested in the subject of veterinary food hygiene might wish to form a special group. Letters on this subject are invited from our readers.

dwarfs which occur about 1 in 100,000 births and are of no particular significance. The former type of dwarf increased in beef-cattle herds as a result of selective breeding for conformation of animals which were unwittingly dwarf gene-carriers. Dwarfs, which were met in the Hereford and Aberdeen Angus breeds, were easily identified by their physical characteristics, but dwarf gene-carrier and dwarf gene-free calves could not be distinguished in this way. Since the occurrence of dwarfs was of economic importance, a satisfactory method of identifying the dwarf gene-carrier was necessary to allow of its elimination. Test breeding would be the most accurate method of identification but it takes so long. A bull can be proved a non-carrier in one year if no dwarf calves are produced from its mating with 15 known dwarf gene-carrier cows. If in four generations a heifer mated to a dwarf bull did not produce a dwarf calf, it could be classified as dwarf-gene free. There was difficulty in maintaining dwarf breeding stock as the mortality among dwarfs was 50 to 75 per cent. by weaning and 95 per cent. by two and a half years.

Another method of identifying the carrier calf has been investigated. This entailed radiography of the thoraco-lumbar vertebrae of the 1- to 10-day-old calf. In dwarf and dwarf gene-carrier calves there was longitudinal compression of the bodies of the last four or five thoracic and all the lumbar vertebrae which gave an undulating effect to their ventral aspect on a lateral radiograph. On a ventrodorsal radiograph of the lumbar vertebrae the transverse processes, which were almost rectangular in the dwarf gene-free calf, were curved anteriorly or " hooked " in the true dwarf and to a lesser extent in the carrier calf. These radiographic findings were being correlated with the results obtained by test breeding in order that the interpretation of the former should be standardised and its accuracy assessed.

L. C. V.

The Teeth of the Ox in Clinical Diagnosis. IV. Dental Fluorosis. NORMAN L. GARLICK (1955). *Amer. J. Vet. Res.* **16.** 38-44.

This is a very well illustrated article showing clearly how the fluctuations in the intake of fluorine are directly reflected by characteristic changes in the incisor and molar teeth of young cattle. It is significant that the first set of teeth do not show any adverse effects of the ingestion of fluorine, as presumably the placental membranes are able to screen out the fluorides. Even although the dam may be ingesting toxic quantities of fluorides continuously the first set of teeth develop normally. Regardless of the source, the effects on developing permanent teeth are the same. Because the developing enamel is sensitive to excess concentrations of fluorides, the enamel changes serve as a constant index, reflecting concentrations over normal. The changes include mottling, disturbed calcification, and hypoplasia. When interpreting the changes, allowance must be made for the time lag, since the process of deterioration will continue for a short time after ingestion has ceased, as the elimination of fluorine from the system will still continue for a variable time.

A slight increase above normal ingestion produces the mottling which gets progressively more exaggerated as the quantity ingested increases, but as this process continues, there is softening of the enamel, probably due to incomplete calcification and deposition of inorganic salts of inferior quality. When the teeth are soft the wear is exaggerated and sometimes there is striking variation in the molar teeth as a result of heavy and irregular wear which is directly proportional to the intake of fluorine. Such changes will of course appear bilaterally since the corresponding teeth on each side erupt together.

In a part of the United States where waters have a high fluorine content, the above pathological changes serve as a valuable index to time and degree of contamination.

N. S. B.

REPORT

Report of the Veterinary Director General. Canada Department of Agriculture. For the Year Ended March 31st, 1955.

This report covers the ten provinces of Canada for one year and provides material which enables an interesting comparison to be made between this country and the U.K.

Whilst most of the diseases recorded are those with which we are familiar, a careful watch is kept for dourine which is not a problem of the U.K. Rabies continues to present a problem, but there have been no cases of glanders since the end of 1938. Only one case of anthrax has been reported. This fact is worthy of further reflection and presumably is influenced by the type of feeding-stuffs which are available. Horse mange has occurred on two widely separated premises and cattle mange on 33 premises involving 197 animals. The latter is stated to be of the chorioptic type. No cases of sheep scab have appeared since 1927. The fact that no cases of swine fever have been reported can, to some extent, be attributed to the rigorous control of importations and to the legal obligation to process swill.

No case of fowl pest has been reported, and Newcastle disease, which receives a separate paragraph (synonym Pneumoencephalitis) is kept under control by vaccination. One outbreak of fowl typhoid involving nine premises was reported in one area and was eradicated by the slaughter policy.

The control and importation, manufacture, sale and use of all biologics as well as the importation of semen is under the control of the veterinary Director General.

The report closes with many interesting tables which show at a glance the state of health of the domestic animal population. It is estimated that there are 9,488,000 cattle in Canada. From the tables it would appear that glanders ceased in 1938, swine fever in 1947 (although there have been two severe outbreaks in subsequent years), and dourine in 1920. Compensation for tuberculosis, however, has mounted steadily from 1915 to the present time, reaching a peak in the 1948-51 period. So, also, has Newcastle disease which reached its peak between 1950 and 1952.

N. S. B.

News and Comment

R.C.V.S. PRIZES

At the meeting of the Council of the Royal College on September 27th, several awards for distinguished work in the veterinary field were made. All the recipients have now intimated their acceptance of the awards which were as follows:—

The John Henry Steel Memorial Medal (in gold), Mr. W. C. Miller and Dr. A. W. Stableforth.

The Livesey Medal (in silver), Dr. P. G. Croft and Dr. T. D. M. Roberts.

The Francis Hogg Prize, Mr. L. W. Hall.

The Steel Memorial Medal was founded in 1892 in memory of John Henry Steel (1855-91) "to perpetuate the memory of an earnest worker, so that his example may incite others, and to benefit the profession by encouraging and rewarding merit." The Medal is voted by the Council as a reward for scientific or literary work of merit connected with the profession. The first, awarded in 1897, was made to Sir John M'Fadyean and to Sir Frederick Smith; there are also among its distinguished past recipients the names of Sir Frederick Hobday, William Hunting, and Sir Stewart Stockman.

The Livesey Medal was founded under the estate of the late Geoffrey H. Livesey (1874-1943) to be awarded by the Council "to the person who in their judgment has done the most serviceable work towards the prevention and/or alleviation of pain and/or fear in animals." The only previous recipients of the Medal have been Professor J. G. Wright and Mr. G. C. Knight.

The Hogg Prize was founded under the will of the late Major Francis Hogg (1887-1949), and is being awarded for the first time. The Prize is awarded to the person who, in the Council's opinion, has done the most serviceable work towards the advancement of small-animal practice.

The Council has awarded a Sir Frederick Smith Research Fellowship of a value of £600 to Mr. P. H. Lamont (Edinburgh); this is the first time that an award has been made under the new regulations which combined the income from the Sir Frederick Smith, Miss Aleen Cust and Jubilee Memorial funds. A grant from the funds has also been made to Mr. L. F. Taffs.

The Council announced the names of the recipients of the Fitzwygram and Williams, Walley and Lawson Prizes for 1955, these are:—

The Fitzwygram Prize, Mr. J. Sanford (Liverpool).

The Williams, Walley and Lawson Prize, Mr. R. R. MacKay (Glasgow).

THE THOMAS BAXTER PRIZE FOR 1956

Mr. L. E. Rowson, O.B.E., M.R.C.V.S., is the winner of 1956 Thomas Baxter Prize. As a pioneer in the technique of artificial insemination he was responsible for building up the first A.I. centre in Britain in the early days of the last war. There are now 29 main centres, and more than half the cattle in England and Wales are inseminated from them. Mr. Rowson also took a leading part in developing the deep-freeze method of preserving bull semen.

All his work has been done at Cambridge. He started the first A.I. centre there in 1942 and is veterinary director of it. He also is Deputy Director of a Unit of the Agricultural Research Council situated nearby and working on animal physiology and biochemistry.

Mr. Rowson has done pioneer work on the transplantation of fertilised eggs in sheep whereby many "offspring" of a valuable ewe can be born naturally to other sheep and reared by them.

Each year the Thomas Baxter Prize is given for outstanding service in some particular aspect of milk production. On this occasion the field was applied research. The Prize is administered by a committee of leading farmers and scientists, of which the Earl De La Warr is chairman. It carries the Thomas Baxter Trophy, a gold medal, and the sum of £100. It was instituted in 1949 to mark the services to milk producers of the late Sir Thomas Baxter, first chairman of the Milk Marketing Board.

UNIVERSITY NEWS

London

Official Opening of New R.V.C. Session

The official opening of the session was held at the Royal Veterinary College on October 1st, when the prizes for the previous session were presented by Sir William Slater, K.B.E., D.SC., F.R.I.C., Secretary of the Agricultural Research Council.

Professor Sir Charles Lovatt Evans, Chairman of the Council, presided, supported by the Principal, Mr. R. E. Glover. With them on the platform were Lt.-Col. Sir Merrik R. Burrell, BT., Vice-Chairman of the Council, Professor J. McCunn, Vice-Principal, and Professor T. J. Bosworth, Vice-President of the Royal College of Veterinary Surgeons. Among the other guests present were Lady Slater, Lady Lovatt Evans, Mrs. Glover, Mr. G. Clark (Deputy Academic Registrar and Secretary to the Collegiate Council of the University of London), Dr. R. Scarisbrick (Deputy Chief Scientific Officer, Agricultural Research Council), and Mr. Alec Hobson (Secretary of the Royal Agricultural Society of England). A number of members of the Council of the College attended.

The prize-winners were as follows:—

M.R.C.V.S. P. A. Mullen, J. G. Hollands, J. M. Hime, D. K. Blackmore, A. K. Prasad, and R. K. Edgar.

B.Vet.Med. Clinical Part I. P. G. H. Mann, R. M. Griffin, B. A. Baldwin, P. T. Dyson, and K. C. Sykes.

B.Vet.Med. Pre-Clinical Part II. J. D. O'Shea, R. Bradley, D. W. H. Wade, T. Van Laun, and M. M. Toes.

B.Vet.Med. Pre-Clinical Part I. K. Evans, B. S. H. Potter, D. E. Noakes, F. C. Ball, and H. Fraser.

Cambridge

The Michaelmas term, and a new academic year, began last week. In the Department of Animal Pathology, Dr. S. D. Elliott is back after spending three months at the Rockefeller Institute, New York. Dr. H. P. Chu has spent the long vacation in Egypt, where he has been working on diseases of poultry under the auspices of the Food and Agriculture Organisation of the United Nations. Work on respiratory diseases of poultry is being intensified with the aid of the Agricultural Research Council, who have financed the appointment of two research students to work with Dr. Chu.

Professor W. I. B. Beveridge has been attending a Conference on Pig Diseases in Berlin and a Veterinary Conference at Leipzig, and has read papers at both.

Dr. Morris Pollard, Professor of Preventive Medicine in the University of Texas, who has been working on virology at Cambridge for the past nine months, has just left for the United States.

In the Department of Veterinary Clinical Studies, Dr. D. W. B. Sainsbury, B.SC., PH.D., M.R.C.V.S., of London University, has taken up his Demonstratorship and will be concerned mainly with the teaching of animal health. Mr. D. E. Stephenson, B.V.SC., M.R.C.V.S., of Liverpool University, has been appointed to the May & Baker Research Fellowship in Anaesthesia tenable in the Department.

LEGAL NOTE

The Court of Appeal recently allowed an appeal by the British Transport Commission from a judgment of Sir Gerald Hargreaves at Warwick County Court. Sir Gerald had awarded damages to Mr. A. A. Langton for injuries suffered by a hunter mare during railway transit. In reversing the decision the following points were made by Lord Justice Denning.

The horse had been sent at "company's risk rates" and so the burden was on the trader to provide the necessary proof. The first question here was whether the trader—the farmer in this case—had given sufficient proof. Mr. Langton naturally enough had not any direct evidence at all as to how this horse came to be injured. He was not there and had no representative; no groom was travelling in the horse-box with the mare. Thus he could only rely on inference; and though his Lordship agreed that a trader was entitled to rely on a reasonable inference it must be an inference and not a conjecture or surmise. He had also relied on the evidence of the veterinary surgeon who had been asked: "Would mere fright alone in your opinion be enough to cause the hind legs to push right forward and sit her down on her rump?" He had answered: "Not so likely as concussion from shunting would."

Having regard to the cases decided on similar issues for many years past his Lordship thought it right to say that the mere fact that an animal was down in the box and severely injured, even though there had been shunting, did not warrant an inference that the injury was due to the neglect or default of a railway company but was a matter of conjecture, surmise, or guess. It might equally be due to the animal taking fright or for some reason getting restless and kicking in the box and being generally upset. The appeal must be allowed.

Lord Justice Hodson, concurring, said that the facts relied on for the plaintiff did not raise any inference of neglect at all.

A horse might take fright, whether it was docile or not, merely by being subjected to being confined in a small space.

Lord Justice Morris delivered a concurring judgment.

OPENING OF NEW N.F.U. HEADQUARTERS

Queen Elizabeth, the Queen Mother, opened Agriculture House, Knightsbridge, the new headquarters of the National Farmers' Union, on October 18.

The Queen Mother was greeted by Sir James Turner and Lady Turner, and presented to officials of the Union before moving up to the Council chamber where those present included the Minister of Agriculture, Mr. D. Heathcoat Amory, Mr. Tom Williams, former Labour Minister of Agriculture, Viscount Hudson of Pewsey, former Minister, Lord Bledisloe, Alderman E. G. Gooch, President of the N.U.A.W., the Presidents of the National Farmers' Unions of America, Scotland and Ulster, and many other notable agriculturalists.

"This is indeed a wonderful day for the N.F.U.," Sir James said in his address of welcome. "If there were room enough, and if the work in the fields could be abandoned for just one day, every single one of our members would wish to be here to greet you this afternoon."

In her reply the Queen Mother referred to the "new look" of the countryside brought about by the new buildings needed by new techniques and requirements. "They may affect for good or ill its appearance for generations to come and here the farming industry has both a responsibility and an opportunity," she said. "The special beauty of the countryside should be one of our most treasured assets and it behoves us to do all we can to ensure that good farming and good looks go hand in hand."

The Queen Mother expressed her pleasure at the action of the Union in founding a special research Fellowship for the study of new farm architecture to mark the occasion of the opening of the new building. She added, "The farming industry may well be proud that to-day the farms of Britain produce enough to supply more than half the population of our small, crowded island. The yields of our farms are now amongst the highest in the world."

After the unveiling of the commemorative plaque, the Queen Mother signed the visitors' book and accepted from Sir James Turner a William IV silver gilt wager cup on a George III silver waiter, before making a short tour of the new building and taking tea with the members.

The N.F.U. established its headquarters at 45 Bedford Square in 1919 when it was 11 years old and

had a membership of 80,000. By the end of the last war membership had more than doubled and 44 Bedford Square and other properties were acquired to accommodate the expanding staff. The need for a new headquarters, however, where all the staff could be under one roof, and having better facilities for meetings, became increasingly urgent. The Knightsbridge site was purchased in 1950 and 1951 and permission to build was obtained in 1954.

The new Fellowship to which the Queen Mother referred is for approved architects and is valued at £1,800 for two years. The Nuffield Foundation are to be responsible for the selection of a candidate and for approving and supervising his work during the tenure of the award. A spokesman said that a study of the whole field of agricultural research had revealed that the scientific study of farm buildings with the object of reducing labour and working costs and increasing efficiency had been comparatively neglected. In spite of the increase in new farm buildings and the adaptation of old ones since the war, there were very few architects in Britain to-day who were sufficiently trained to direct or advise on such work.

PROSECUTION FOR UNQUALIFIED PRACTICE

The Royal College of Veterinary Surgeons successfully prosecuted Mr. Robert White-Hook, of Orpington High Street, Kent, at Bromley Magistrates' Court, on September 7th, 1956. There were two summonses under Section 5 (1) of the Veterinary Surgeons Act, 1948. One summons alleged that Mr. White-Hook held himself out as being prepared to practise veterinary surgery. The other summons alleged that he practised veterinary surgery by treating a kitten.

Mr. R. A. Barr, Barrister-at-Law, appeared on behalf of the College, whilst Mr. White-Hook was defended by Mr. R. J. A. Batt, Barrister-at-Law. Mr. White-Hook pleaded not guilty to the first charge, but guilty to practising veterinary surgery in treating the kitten.

In the circumstances, Mr. Barr, for the Royal College, accepted the plea of guilty on the one summons and asked the Court to mark the first summons "Not proceeded with." After Counsel had addressed the Court, Mr. White-Hook was fined £25 plus ten guineas costs.

It is understood that this is the 62nd successful prosecution by the Royal College under the Veterinary Surgeons Act, 1948.

NON-NOTIFICATION OF FOWL PEST

Leonard Frederick Wells, of Moorcroft Avenue, Dawes Heath, was fined £20 at Southend recently and ordered to pay five guineas costs for failing to notify the police of suspected fowl pest on his premises.

It was stated in evidence that a veterinary surgeon of the Ministry of Agriculture called at defendant's premises to investigate the cause of an outbreak of fowl pest and found that some of 230 poultry had symptoms of fowl pest, and Mr. Wells had not notified this to the police.

When fowl pest was disclosed persons were not allowed to go where the birds where kept, but later that day Mrs. Wells phoned a veterinary surgeon and asked him to call and examine the poultry as one fowl was sneezing. She said she would like a check-up as a farmer had said her chickens were spreading the disease.

The veterinary surgeon confirmed fowl pest, but Mrs. Wells said she saw no necessity for him to report the matter because someone from the Ministry called in April. She did not reveal that the Ministry's inspector had been there that day and she should not have called the veterinary surgeon to the premises.

On four occasions fowl pest had been confirmed on defendant's premises, three times in 1955. The Ministry's veterinary surgeon thought that fowl pest had been in existence two weeks before he called.

R.V.C. STUDENTS' UNION BALL

The annual commemoration ball of the Students' Union, Royal Veterinary College, will take place on Friday, November 9th, at the College, from 8 p.m. to 2 a.m. There will be two bands, and the tickets (15s. double) will include a running buffet. All members of the profession and their friends will be welcome, and formal dress is requested.

THE CENTRAL VETERINARY SOCIETY

The attention of readers in small-animal practice is drawn to the meeting of the "Central" on the evening of November 1st. The subject is leptospirosis, and the speaker is Dr. W. I. M. McIntyre, of the University of Glasgow Veterinary School, who will be presenting the main paper which will be illustrated by slides. The discussion will be opened by Dr. J. C. Broom, of the Wellcome Laboratory of Tropical Medicine, who is a recognised authority on leptospirosis, and by Mr. Ivor Martin, of Coventry, a practising veterinary surgeon.

PERSONAL

Births

HUSSEY.—On September 27th, 1956, to Ruth (*née* Teverson), M.R.C.V.S., wife of B. F. V. Hussey, at Oakville-Trafalgar Memorial Hospital, Oakville, Ontario, Canada, a daughter, Miriam, sister for Christopher, Nigel, and Adrian.

MCCULLOCH.—On October 12th, 1956, to Eleanor (*née* Cameron), wife of John McCulloch, Veterinary Department, Northern Nigeria, a son.

MITCHELL.—On October 11th, at Griffithstown County Hospital, Monmouthshire, to Sheila (*née* Maclachlan) and Ken Mitchell, M.R.C.V.S., of Oakdene, Monmouth Road, Usk, Monmouth, a daughter, Sandra.

SHARP.—On October 17th, 1956, to Martha, wife of William F. Sharp, B.SC., M.R.C.V.S., 21, Newmarket Street, Skipton, Yorks, a daughter, Rosemary Elizabeth, a sister for Michael.

COMING EVENTS

November

1st (Thurs.). General Meeting of the Central Division, B.V.A., at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

Annual Supper Dance of the Scottish Metropolitan Division, B.V.A., at the George Hotel, Edinburgh.

7th (Wed.). Meeting of the Scottish Regional Group of the A.V.T. and R.W's. in the Lecture Room of the Department of Pathology, The Royal (Dick) School of Veterinary Studies, Edinburgh, 2.15 p.m.

14th (Wed.). General Meeting of the Scottish Metropolitan Division, B.V.A., at the Royal (Dick) School of Veterinary Studies, Edinburgh, 4.30 p.m.

15th (Thurs.). Autumn Meeting of the Eastern Counties Veterinary Society at the Suffolk Hotel, Bury St. Edmunds, 11.45 a.m.

Meeting of the Essex Veterinary Society at the Institute of Agriculture, Writtle, Nr. Chelmsford, Essex, 7.30 p.m.

16th (Fri.). Dinner-Dance of the Yorkshire Division, B.V.A., at the Royal Station Hotel, York.

22nd (Thurs.). Annual Dance of the Victoria Veterinary Benevolent Fund, County of Ayr Ladies' Guild at Western House, Ayr, 8 p.m.

22nd and 23rd (Thurs. and Fri.). B.V.A. Conference on Supplements and Additives in Animal Feeding-stuffs at the Victoria Halls, Bloomsbury Square, London, W.C.1.

26th (Monday.). Annual Dinner of the Centaur Society at the Grand Hotel, Bristol, 7 p.m.

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN LONDON

Wednesday, November 7th, at 7, Mansfield Street

10.00 a.m. Veterinary State Medicine Committee.
12.00 noon Parliamentary and Public Relations Committee.
2.15 p.m. Farm Live-stock Committee.
4.00 p.m. Home Appointments Committee.

Thursday, November 8th, at 7, Mansfield Street

10.00 a.m. Small-Animals Committee.
12.00 noon Finance Sub-committee.
2.00 p.m. General Purposes and Finance Committee.

Friday, November 9th, Connaught Rooms, Gt. Queen Street

10.30 a.m. Meeting of Council.

FOOT-AND-MOUTH DISEASE

The areas described in the schedule below will cease to be Infected Areas for the purpose of preventing the spread of foot-and-mouth disease on October 29th, 1956:—

The City and County Borough of Bristol.

IN THE COUNTY OF GLOUCESTER

In the Petty Sessional Division of Lawford's Gate: The parishes of Kingswood, Oldland, and Hanham Abbots.

IN THE COUNTY OF SOMERSET

In the Petty Sessional Division of Keynsham: The parishes of Keynsham, Compton Dando, and Whitchurch.

In the Petty Sessional Division of Temple Cloud: The parishes of Publow, Stanton Drew, Chew Magna, Chew Stoke, and Norton Malreward.

In the Petty Sessional Division of Long Ashton: The parishes of Winford, Dundry, Barrow Gurney, Long Ashton, Abbots Leigh, Wraxall, and Flax Bourton.

IN THE COUNTY OF NORTHAMPTON

The Borough of Daventry.

In the Petty Sessional Division of Daventry: The parishes of Barby, Kilsby, Crick, West Haddon, Flore, Weedon Bec, Everdon, Fawsley, Hellidon, Catesby, Watford, Long Buckby, Whilton, Norton, Brockhall, Dodford, Newnham, Badby, Staverton, Braunston, Ashby St. Ledgers and Welton, and so much of the parish of Charwelton as lies to the north of the road running from Preston Capes to Priors Marston including the said road.

In the Petty Sessional Division of Northampton: The parishes of Ravensthorpe, East Haddon, Brington and Althorp, and so much of the parish of Harleston as lies to the west of the main road (A.428) running from Northampton to West Haddon including the said road.

IN THE COUNTY OF WARWICK

In the Petty Sessional Division of Southam: The parishes of Upper Shuckburgh and Wolfhampcote.

In the Petty Sessional Division of Rugby: The parish of Willoughby.

IN THE COUNTY OF KENT

In the Petty Sessional Division of Tonbridge: The parishes of Edenbridge, Hever and Cowden, and so much of the parish of Chiddingstone as lies to the west of the road running from Ide Hill via Winkhurst Green and Somerden to The Horseshoes excluding the said road.

IN THE COUNTY OF SURREY

In the Petty Sessional Division of Godstone: The parishes of Lingfield and Crowhurst and so much of the parishes of Tandridge and Limpsfield as lies to the south of the railway running from Godstone Station to Edenbridge Station excluding the said railway.

IN THE COUNTY OF EAST SUSSEX

In the Petty Sessional Division of East Grinstead: The parish of East Grinstead and so much of the parishes of Forest Row, Hartfield, and Withyham as lies to the north of the main road (A264) running from East Grinstead to Tunbridge Wells including the said road.

FOWL PEST

Numerous outbreaks of fowl pest continue to occur in parts of Lancashire, mainly in areas of high poultry density. To bring the situation under more effective control, and to reduce to the minimum the risk of spread, the Minister of Agriculture has made an Order entitled the Fowl Pest (Mid-Lancashire Infected Area) Order, 1956. This Order brought into effect, on October 20th, the provisions of the Fowl Pest (Infected Areas Restrictions) Order, 1956, in the area mentioned below:—

The County Boroughs of Blackpool, Preston, and Southport. The Boroughs of Chorley, Fleetwood, and Lytham St. Anne's.

IN THE COUNTY OF LANCASTER

The Petty Sessional Division of Garstang comprising the parishes of Preesall with Hackensall, Pilling, Stalmine-with-Staynall, Hambleton, Out Rawcliffe, Win-

marleigh, Nateby, Cabus, Forton, Nether Wyersdale, Bleasdale, Barnacre with Bonds, Claughton, Garstang, Kirkland, Catterall, Upper Rawcliffe-with-Tarnacre, Little Eccleston-with-Larbreck, Great Eccleston, Elswick, Inskip-with-Sowerby, Myerscough, and Bilsborrow.

The Petty Sessional Division of Amounderness
comprising the parishes of Bowland-with-Leagram, Chipping, Thornley-with-Wheatley, Goosnargh, Dilworth Barton, Whittingham, Hothersall, Alston, Grimsargh, Haighton, Broughton, Fulwood, Lea, and Woodplumpton.

The Petty Sessional Division of Walton-le-Dale
comprising the parishes of Cuerdale, Walton-le-Dale, and that part of the parish of Samlesbury as lies within the Petty Sessional Division.

The Petty Sessional Division of Leyland
comprising the parishes of Penwortham, Hutton, Farington, Cuerden, Clayton-le-Woods, Leyland, Much Hoole, Little Hoole, and Longton.

The Petty Sessional Division of Leyland Hundred
comprising the parishes of Hesketh-with-Becconsall, Tarleton, Rufford, Bretherton, Croston, Mawdesley, Bispham, Heskin, Eccleston, Ulnes Walton, Euxton, Charnock Richard, Coppull, Adlington, Anderton, Heath Charnock, Heapey, Whittle-le-Woods, Wheelton, Brindle, Withnell, and Hoghton.

The Petty Sessional Division of Fylde
comprising the parishes of Thornton, Poulton-le-Fylde, Singleton, Hardhorn-with-Newton, Weeton-with-Preese, Westby-with-Plumptons, Greenhalgh-with-Thistleton, Medlar-with-Wesham, Treales Roseacre and Wharles, Ribby-with-Wrea. Kirkham, Bryning-with-Warton, Freckleton, and Newton-with-Clifton.

In the Petty Sessional Division of Southport
The parish of North Meols.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ches. Walkmill Farm, Burleydam (Oct. 12); Lower Mudd Farm, Mottram-in-Longendale (Oct. 15).

Kent. Brewers Hall Farm, Mereworth, Maidstone (Oct. 18).

Lancs. Home Farm, Croxteth, Liverpool, 12 (Oct. 12); Forest Farm, Prescot (Oct. 16).

Norfolk. Hall Farm, Easton, Norwich (Oct. 17).

Salop. Forge Farm, Caynton, Newport (Oct. 15).

Yorks. Selside Farm, Horton-in-Ribblesdale, Settle (Oct. 15).

Atrophic Rhinitis

Dorset. Post Green Farm, Lytchett Minster, Poole (Oct. 12); Buncknowle Farm, Corfe Castle, Wareham (Oct. 17).

Fowl Pest

Essex. 270, Cressing Road, Braintree (Oct. 13); Newlands, Eight Ash Green, Colchester (Oct. 16); 268, Cressing Road, Braintree (Oct. 17).

Lancs. Cross House Farm, Lightfoot Lane, Fulwood, Preston (Oct. 12); Crown Lane Farm, Bartle, Preston; Bullens Farm, Ulnes Walton, Leyland, Preston (Oct. 13); Applegarth, Rosemary Lane, Bartle; Highfield, Thropps Lane, Longton (Oct. 14); Whittlefields, Land Lane, Longton; Laurel Poultry Farm, Cottam Lane, Longton; Cross House Farm, Lightfoot Green, Higher, Bartle (Oct. 15); Wholesome Farm, Longton, Preston (Oct. 16); Hilbre, Croston Road, Farington; Liverpool Road, Bretherton (Oct. 17); Honiton, Drumacre Lane, Longton; Mardale, Woodplumpton Road, Broughton; Hey Fold Farm, Broughton; Cuckstool Farm, Woodplumpton (Oct. 18).

Swine Fever

Bucks. Osbourne Farm, Oxford Road, Denham (Oct. 17).

Cambridge. School of Veterinary Medicine, Milton Road, Cambridge (Oct. 17).

Derby. Tharrow Hall Farm, Sutton on the Hill (Oct. 22).

Dorset Little Burton Farm, Leweston, Sherborne (Oct. 15).

Middlesex. New Inn Farm, London Road, Staines (Oct. 22).

Monmouth. Pant Farm, St. Mellons, Cardiff (Oct. 22).

Staffs. East Lodge Nurseries, Needwood, Burton-on-Trent (Oct. 12); 100, Main Street, Alrewas, Burton-on-Trent (Oct. 15); Ayre Cottage, Gentleshaw, Rugeley (Oct. 19).

Suffolk. Home Farm, Melton, Woodbridge (Oct. 22).,

Warwicks. New Park Farm, London Road, Sutton Coldfield, Birmingham (Oct. 15); Froggatts Farm, Walmley, Sutton Coldfield (Oct. 16); Aldridge Road Farm, Great Barr, Birmingham, 22a (Oct. 22).

Yorks. Bland Close Farm, Whitecliffe Lane, Ripon (Oct. 15); White Acre Farm, Harshead Moor, Cleckheaton (Oct. 22).

ADVERTISERS' ANNOUNCEMENTS

DEOSAN LIMITED announce that in future Deosan "Red Label" hypochlorite will be known as "Deosan Hypochlorite."

ALLEN AND HANBURYS LIMITED announce the introduction of Entavet Tablets. These contain streptomycin and sulphaguanidine and are particularly convenient for the treatment of calf scours.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 30th September, 1956		28	—	17	29	—	27
Corresponding period in	1955	26	1	—	18	—	31
	1954	16	—	—	8	—	26
	1953	15	—	—	15	—	70
1st January to 30th September, 1956		1,146	8	116	516	—	592
Corresponding period in	1955	549	5	6	401	—	1,138
	1954	221	4	12	602	—	1,162
	1953	505	—	28	737	—	2,290

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Summer Mastitis: Further Observations

Sir,—Weaver *et al.* (1955) showed that *Corynebacterium pyogenes* was recoverable in culture from about 50 per cent. of clinical cases of so-called "summer mastitis."

During the summer of 1955 a further survey was carried out to confirm these results, and it is the purpose of this communication to show that this organism was recoverable only in a similar proportion of cases.

The diagnosis of "summer mastitis" was based on the finding at clinical examination of an acute purulent mastitis in nearly dry or dry cows in July, August and September.

Examination of the udder secretion samples was carried out by several final-year students in the Bacteriology Department of the Royal (Dick) School of Veterinary Studies, Edinburgh, using the same methods as those employed by Weaver *et al.* (1955).

One hundred and twenty udder secretion samples were received and the organisms isolated are shown in the following Table.

C. pyogenes was isolated, in pure culture, from 37 per cent. of the samples and, with other organisms, from a further 10 per cent.

Sixty-four students took part in the survey, most of whom were "seeing practice" with a veterinary surgeon for at least a month. It was, therefore, somewhat disappointing that so few samples were received; however, the general opinion was that the incidence of "summer mastitis" was less than in 1954. Most students reported that they had seen cases from which they did not take samples because the animals had already been treated with antibiotics. This may also explain why some of the samples revealed no bacterial growth on culture with the methods used.

It was again shown that dry cows were more susceptible to infection; of the 56 samples from which *C. pyogenes* was isolated, only seven were from lactating animals. These lactating animals were, however, in the process of being "dried off." The majority of the samples from which *C. pyogenes* was isolated were from first-calf heifers or cows, one to eight weeks before the expected date of calving; however, 13 were obtained from maiden heifers.

In the three remaining samples from maiden heifers in which *C. pyogenes* was not isolated, we were able to isolate *Staphylococcus aureus*. Of the *C. pyogenes* negative samples, all except three were from dry animals, and these three were due to calve within the next three months.

In conclusion we again showed that *C. pyogenes* could only be isolated either in pure culture or with other organisms from approximately 47 per cent. of the samples, and this confirms the previous observations of Weaver *et al.* (1955).

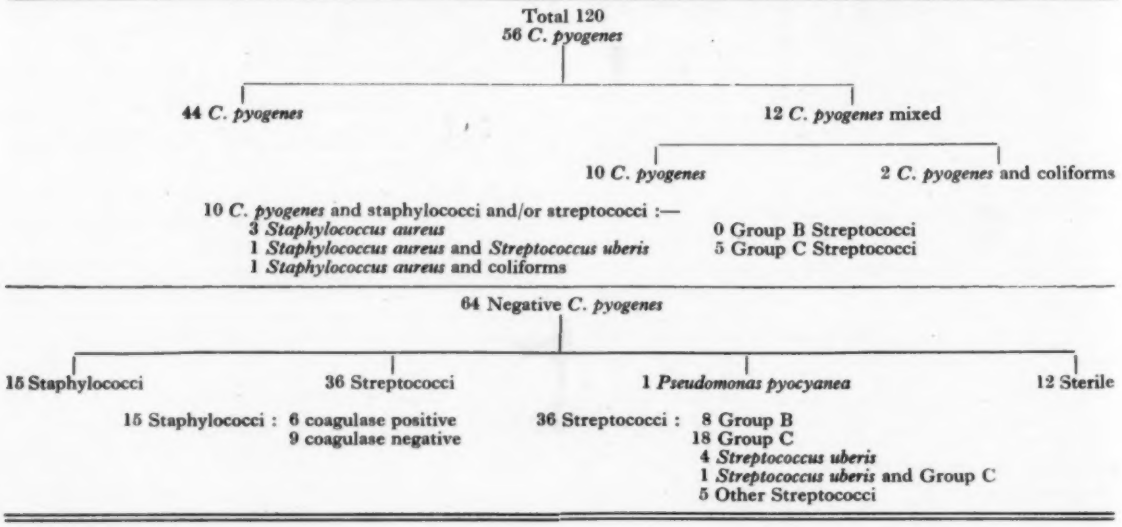
Yours faithfully,

M. W. STONE.

The North of Scotland College of Agriculture,
Drummondhill,
Stratherrick Road,
Inverness.

October 21st, 1956.

Reference

WEAVER, A. D. (1955). *Vet. Rec.* **67.** 735.

ORGANISMS ISOLATED AT BACTERIOLOGICAL EXAMINATION